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3 DEVELOPMENT OF RECIPES USING DEHYDRATED AND CONCENTRATED FOODS

Recent United States Department of Agriculture experience in development of recipes using dehydrated and concentrated foods and testing their acceptance in feeding situations has been of two types -- for school lunch and for institutional use.

For school lunches, a recipe up to 100 portions is developed for a particular commodity starting with a recipe of any size using a similar major ingredient, or some favorite recipe noted for flavor, or other suggestions for new or improved practical and palatable combination. In the process of development, first attention must be given to the nature, culinary properties and nutritive value of the commodity, and to its limitation as a functional ingredient. Adaptations must be worked out accordingly. For example, main dishes for school lunch must contain 2 ounces of certain protein-rich food per serving, which often necessitates more cheese, eggs or meat in mixtures than is common practice for main dishes. Whether the dried food can be used in the recipe without reconstitution must be determined. After the ingredient proportion and preparation procedures have been fairly well defined, the product is improved to meet palatability standards of a panel of food specialists in the laboratory. The recipe with complete directions is then tried out under observation in a cooperative school, the product served to children without comment and records made of plate waste. Only recipes passing this practical school kitchen and pupil service test are released to schools. Some concentrated foods used successfully in school lunch recipes have been nonfat milk solids, dried eggs, dry beans, soy flour, peanuts, brewers' yeast, and dried fruit.

Another type of acceptance testing follows recipe development for use by restaurants, hospitals and other institutions. In this case the stages in recipe development in the laboratory are similar to that for school lunch recipes, but with even more emphasis on appearance and taste appeal and attention to simplified rapid methods of preparation. When the recipe has been standardized and has met acceptance in the laboratory, it is sent to a panel of some 45 cooperating restaurants, cafeterias and hospitals throughout the U. S. who test the recipe and report back on its practicality and any other features on which each chooses to comment. The comments received have been varied, interesting and helpful. The recipe is then adjusted if necessary and published in a series for distribution to a request list of over 10,000 groups engaged in quantity food service. The commodities studied are those in current or anticipated plentiful supply throughout the country. Among the concentrated foods on which some work has been done in the Bureau of Human Nutrition and Home Economics laboratory are dried fruits of various kinds, dried beans, nuts and dry milk.

At intervals over the last decade special laboratory work on many types of concentrated foods have been carried out. Usually household recipes are developed through the stage of acceptance to laboratory staff and published in leaflets or special releases. This work has included studies of dry skim milk, soy flour, potato flour, dried yeast, sirups, honey, many kinds of dried fruits, vegetables and legumes. Notes on some of the Bureau's experiences in utilization of concentrated foods are outlined below. (A few selected recipes will be supplied later).



Dry milk

Nonfat milk solids reconstituted to a product slightly more concentrated than fluid skim milk has proved more acceptable than the fully diluted product. For this reason all directions from the Department of Agriculture call for one pound of dry milk powder to 4 quarts of water, rather than 5 quarts, as some industry labels require, which actually over dilutes it somewhat. Work in the Bureau of Dairy Industry shows general acceptance of a well flavored drink from skim milk which has a solids content 2 to 3 percent above the usual¹. Flavored beverages from dry milk, as with vanilla, tomato juice, molasses, or peanut butter were found to be acceptable to relatively few individuals unless tastes have been cultivated. Reconstituted milk flavored with cocoa is acceptable to more persons than milk with other special flavors. However, in observations on fluid milk, plain milk has been found to be as well or better accepted than cocoa flavored milks.

Easy reconstitution is accomplished with the milk solids sprinkled over water in a bowl and mixed vigorously with a beater. If prompt refrigeration is available, the water may be slightly warmed (about 140-160°F.) to hasten solution and then the mixture chilled thoroughly and kept refrigerated the same as fresh milk. If warm water is not advisable the mixture should stand a short while for complete solution before serving. Reconstitution is necessary for beverages and in the home these should be prepared in small quantities only as needed.

For most cooked foods and some confections the milk powder may be treated as a dry ingredient, and water or fluid milk used as the liquid. Exceptions are sauces and soups where the volume of dry ingredients is less than the volume of dry milk and partial reconstitution prevents lumping. The high lactose content (52%) of nonfat dry milk favors its use in desserts and beverages, but may limit its use in non-sweet products and those where excessive browning is likely. It is easily possible, however, to incorporate in cooked foods enough of the solids to be equivalent to a pint of milk daily in the diet.

In breads, nonfat milk solids up to 10 percent of the weight of the flour improves the flavor and acceptability to school children, without creating technological problems in handling the dough or in baking thoroughly before excessive browning. From the nutritive value angle, the content of calcium, riboflavin and animal protein is enhanced, but thiamine may be lower than in bread made with enriched flour unless enrichment wafers are used to adjust the thiamine content. The quantity of milk that can be obtained through bread alone is relatively insignificant unless the bread consumption exceeds half a pound daily. Many formulas high in milk solids and yielding very acceptable products have been developed in different parts of the country.

Soy flour

Experimental work with soy flour in home cooking in the 1940's indicated the need for a processed product of better quality than available at the time¹. Particle size in relation to water absorption to be expected was one problem. Later tests with soy flour in breads indicated that tech-

nologically it could be incorporated up to 6-8 percent levels without adverse effects on loaf quality, but palatability differences were noted at levels above 4 percent. For this reason in the development of school lunch yeast breads, none were attempted with soy flour content higher than 4 percent of the total flour by weight. Such yeast breads were fully acceptable to children as were muffins and quick breads with soy flour content up to 12 percent of the flour.

Potato flours

Limited experience with potato flours indicate that satisfaction and convenience is possible in the use of white potato flour as a staple ingredient for many food mixtures. A dark product made from unpeeled potatoes was unsatisfactory in flavor, cooking and sanitary quality.

Wheat germ

The quality of product available differs widely and standardization, perhaps with specification for minimum limits of certain nutrients, is desirable to help protect consumers. Some processed forms carry a bitter flavor and varying degrees of rancidity. For yeast breads, wheat germ must be heat-processed to lessen enzyme action and may be used in amounts up to 3 to 5 percent of the flour. A well-flavored product can be added in higher proportions to many quick breads and cakes, or be mixed with cooked and ready-to-eat cereals.

Dried yeast

Little work has been done using dry food yeasts in recipes. During the development of the school lunch breads, it was found that inactivated brewers' yeast, up to 2 percent of the flour by weight, proved acceptable to school children and easily handled in the school lunch kitchen. However, the bread presented technological problems in commercial baking.

Dried eggs

No flavor problems have been encountered in the use of dried eggs currently available when they had been properly stored. In school lunch acceptance studies it was found that in some regions main dishes composed largely of eggs were less acceptable than other types of main dishes. The relation to eggs in home meals was not investigated.

Studies of heat penetration rates in egg custards and other eggs containing mixtures revealed the desirability of using dried eggs only in mixtures to be baked (not those cooked on top of stove) in order to insure internal temperatures that would make the product safe from pathogenic organisms. Fortunately, for quantity food service, baking is simpler than top of stove cooking if the oven equipment is available.

Peanut butter

Peanut butter is an American favorite, especially with children. Some families serve it regularly, like butter and jams, as a spread for breads. The flavor combines well with that of bread, pickles and sweets, such as in sandwich fillings, cookies, confections made with honey, preserves and

dried fruits. A variety of recipes are available suggesting ways of using it. If rate of use is slow, small containers and refrigeration after opening may be desirable to prevent rancidity development.

Dried beans (pulses)

Various kinds of dried beans are favorites in different parts of the U. S. and they are not always interchangeable in recipes. Each has its own characteristic texture and flavor that has come to be associated with traditional food combinations. Kidney beans and pea beans are common in the Northern States; blackeye peas (cowpeas) in the Southern; lima beans (butter beans) in the far West and the Southeast; pink beans throughout the desert Southwest and among Spanish-American groups. Soybeans are not yet highly accepted by many people but are widely used in some form by vegetarian groups. The wide range of dishes in which beans are acceptable--even traditional -- include the Boston baked beans, Mexican chili with beans, California baked limas and the more widely used pork and beans, fresh or canned, with or without tomato sauce.

Wherever dried beans are used, two common problems are recognized--the long time and inconvenience required for cooking, and the need to supplement the legume protein with protein from animal sources. It is noteworthy that most traditional favorites call for some kind of meat or cheese -- as pork in pea beans and blackeyed peas; ground beef in chili con carne, cheese in enchiladas and bacon, ham trimmings or frankfurters (mixed processed sausages) in lima beans.

Special attention has been given recently in Department laboratories to the development of more rapid methods of cooking beans. The Bureau of Agricultural and Industrial Chemistry had dealt with commercial and large scale processing. The BHNHE has worked on kitchen methods. The latter found that one hour soaking following 1 to 2 minute boiling resulted in about as much water absorption during soaking and reduction in time during cooking as did an overnight soak in cold water. Also there was less tendency to fermentation or spoilage and adverse effect on flavor, less shift to an acid pH and effect on skin texture in the presence of calcium and hardwater salts. The beans must be cooked in the soaking water to minimize nutrient loss from the hot water soaking. This procedure for a boiling-water-soaking of about one hour prior to cooking is suitable preparation for small or large quantity food service and as the basis for almost any type of recipe. If work schedules require it, longer soaking times may be used, but the 2-minute boil prior to soaking is needed to reduce the number of microorganisms present and help minimize spoilage.

Tomato paste

School lunch experience with a tomato paste unseasoned except with salt has shown it to be widely acceptable and very versatile in use. Because of the bland flavor it combines well in many main dishes for children, especially those of meat and spaghetti or similar pastes and dried beans. It is convenient for use in soups and sauces and dilutes well into a beverage.

Fruit juice concentrates

In school lunch testing, canned citrus juice concentrates (not frozen) have been found highly acceptable, especially in schools in low-income communities. The requests for repeated servings at midmorning feedings would indicate that it could compete well with carbonated beverages. Experimental work was with concentrates requiring 1 to 6 dilution; some requiring dilutions of 1 to 8 are in current use.

Increased production and consumption in the U. S. of other concentrated fruit juices - apple, grape and prune - in flavors preferred to citrus by many people, indicate a probable need for fortification of these with Vitamin C if constant users depend upon them in meals to the exclusion of citrus juices.

Dried fruits

Dried fruits, especially those from modern processing and packaging, offer many possibilities in recipe development that have not yet been explored. Their place in reserve food supplies should not be overlooked. Many of high moisture content may be eaten out of hand. Dried fruits on which recipe development work has been done include apples, apricots, currants, dates, figs, peaches, pears, prunes, and raisins.

Combining dried fruits without precooking them is possible in most recipes using the tender forms available and this helps retain the natural fruity flavors. Ground or finely chopped they blend well into flour mixtures, such as in nut breads, cookies, spice cakes and muffins to be cooked quickly and in larger pieces into the traditional fruitcakes and puddings. With a little rehydration and some precooking, many can be used in upside-down cakes, cereal puddings, and crust combinations like canned or fresh fruits as in tarts, pies, and crisp crumb toppings. Tender dried fruits may be incorporated directly into confections without cooking, and if pasteurized they may be stored for short periods. Acceptable mixtures include ground dried fruit, dry milk, ground nuts or peanut butter, and honey.

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